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terial comprises corrugated card-board and honey-comb material. The cost of such a preferred pallet is such that it can be treated as expendable.

(54) Load carrying pallet

(57) In a load carrying pallet wing sections (2,3) are hingedly connected to a base section (1) and pivoted under the base section and secured thereto to provide support elements for holding the base section above the ground. In one embodiment the wing sections are formed from a single base element which also provides the material for the base section. The preferred ma-

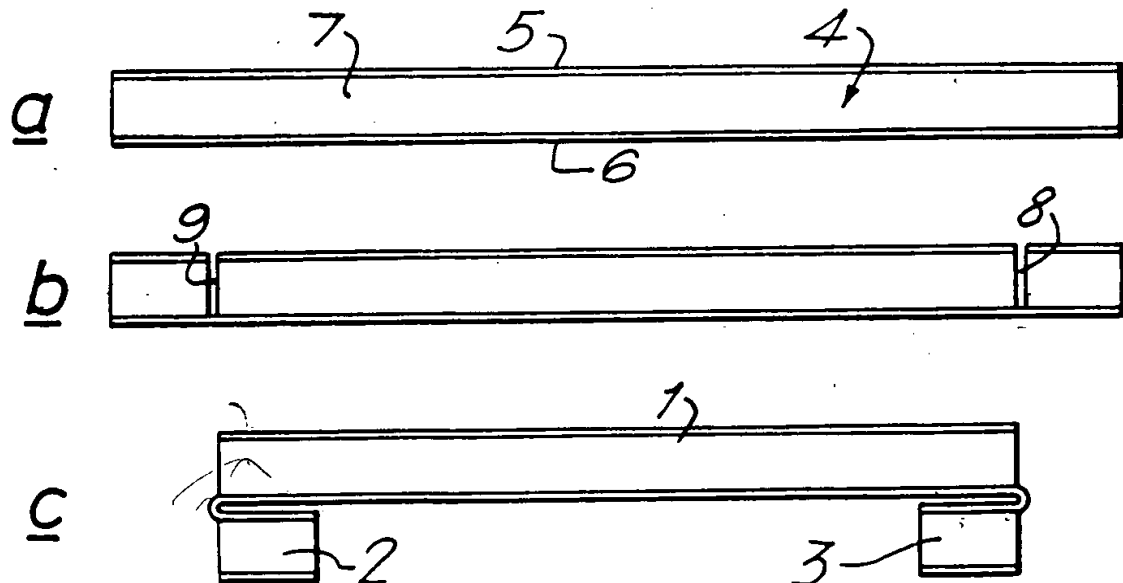


FIG.1.

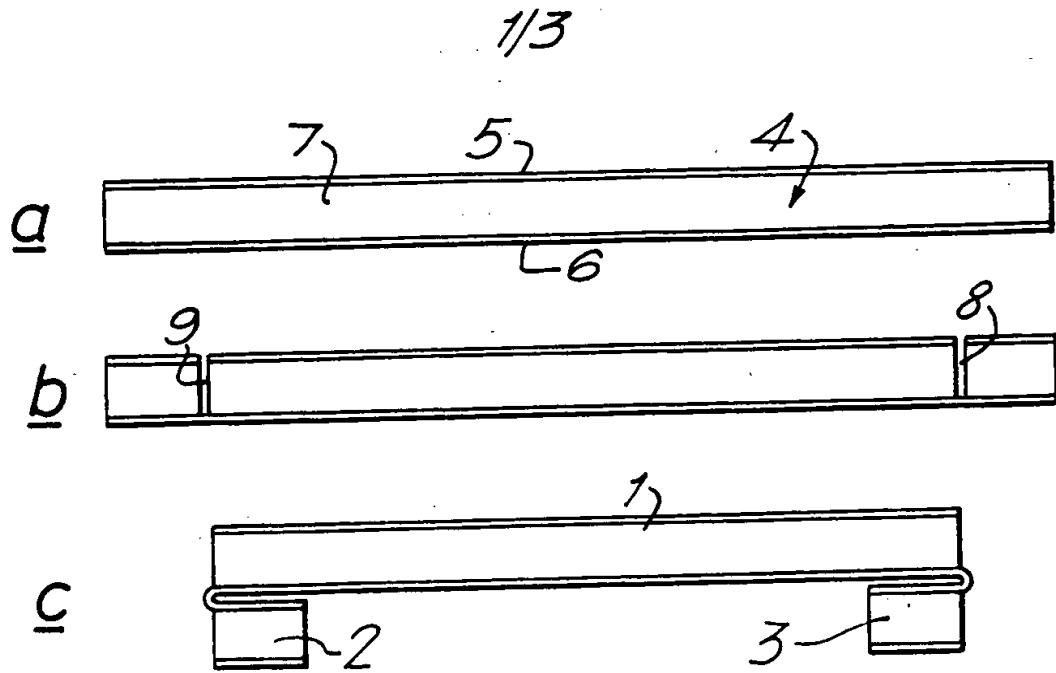


FIG.1.

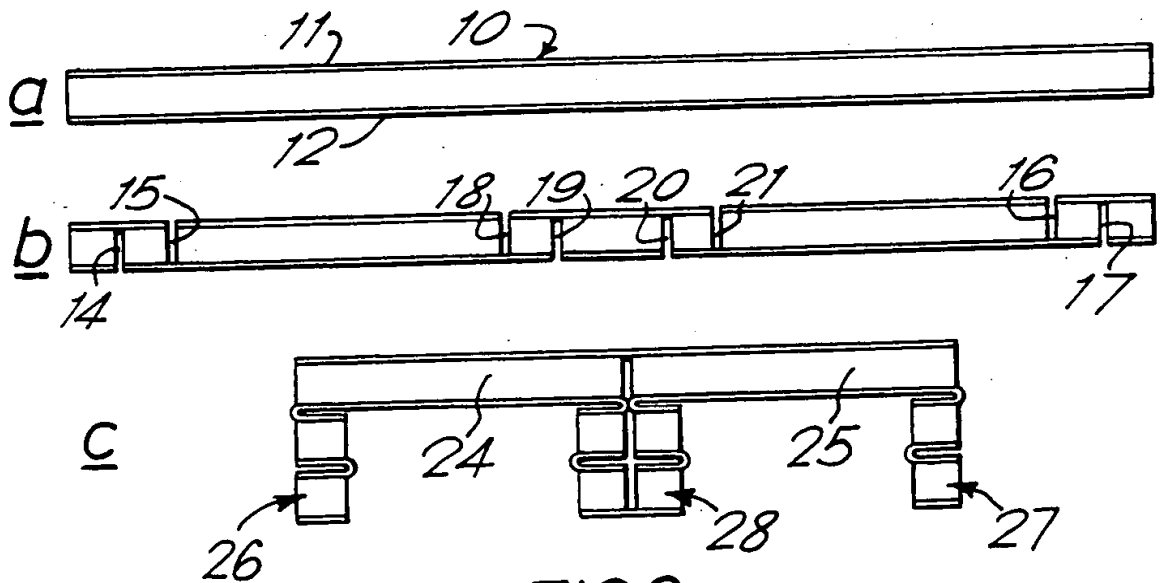


FIG.2.

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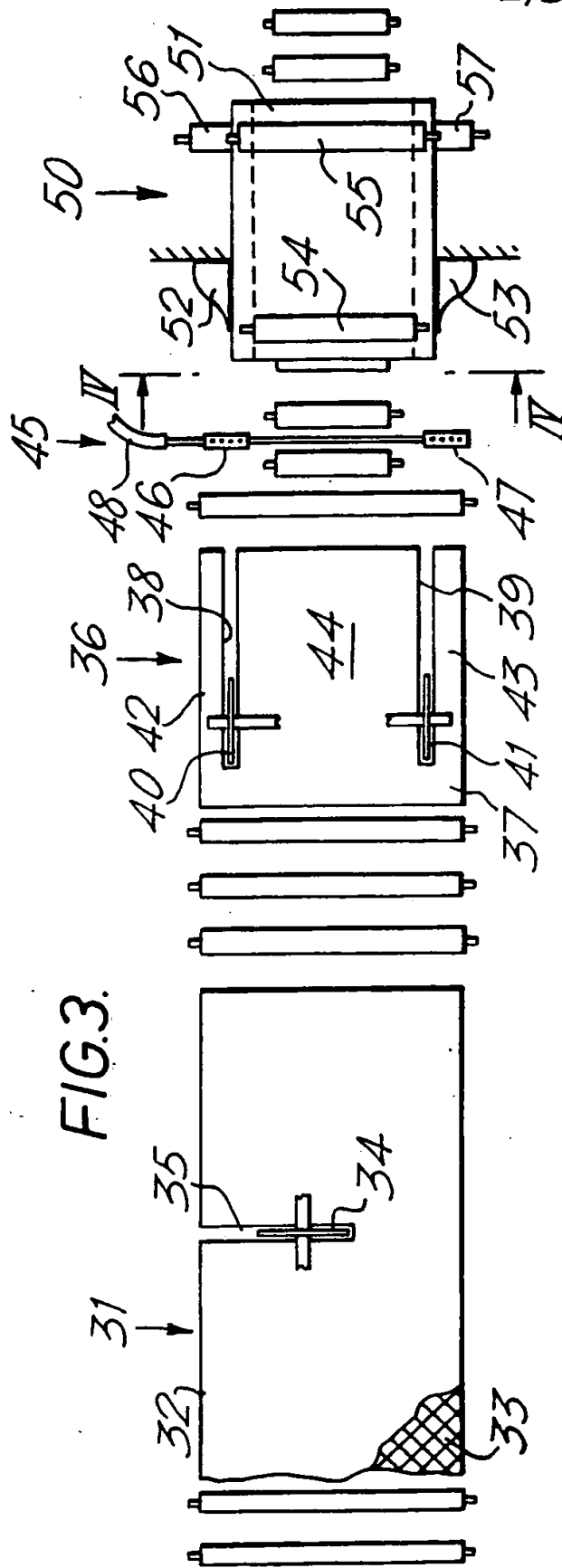


FIG. 3.

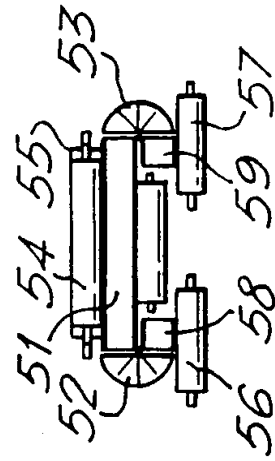


FIG. 4.

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FIG.5.

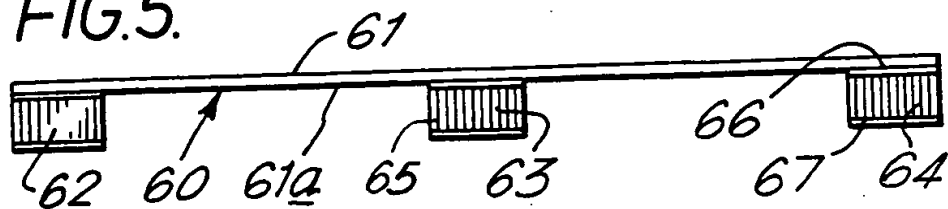


FIG.6.

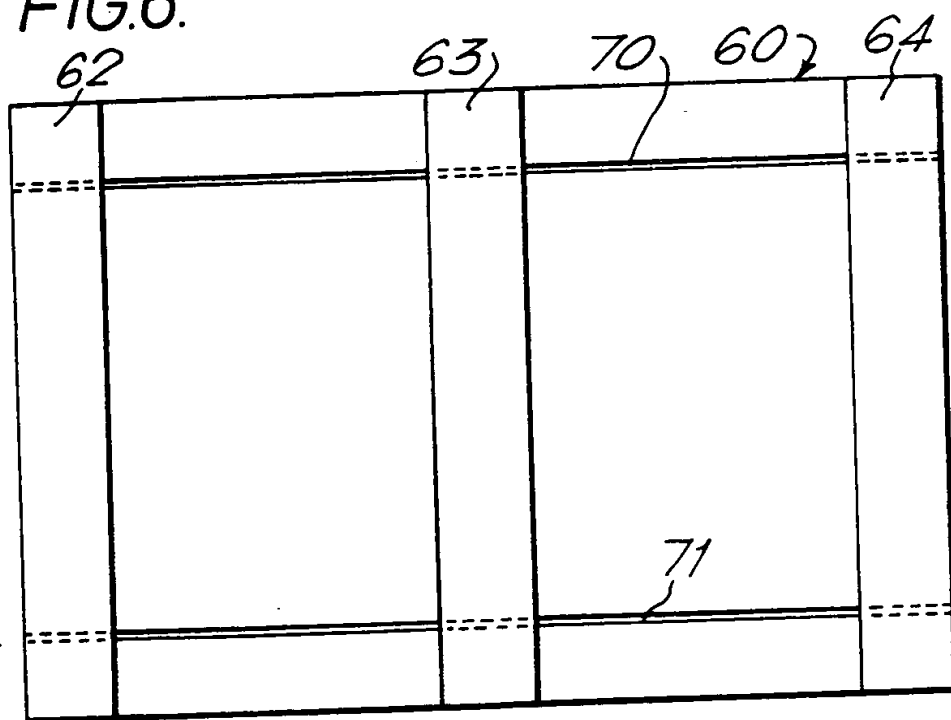
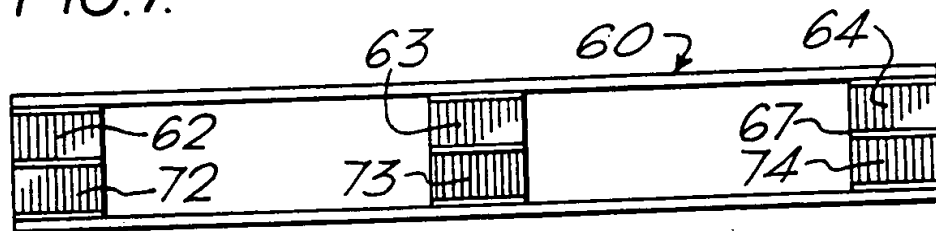


FIG.7.



SPECIFICATION

Load carrying pallet apparatus and method

5 This invention relates to load carrying pallets and to the construction of such pallets, processes for the manufacture of such pallets and apparatus for the manufacture of such pallets.

10 Although pallets have substantial advantages in improving the mechanical handling of commercial products, their use brings a number of disadvantages which are not otherwise present. In the first place pallets themselves occupy space which would otherwise be available for other products. In addition, pallets, particularly wood pallets, are so expensive to produce that it is economically necessary that they be reused and this involves considerable handling costs in returning the pallets to the manufacturer of the goods. Finally, it may be noted that pallets constructed of wood are subject to damage by the tines of a fork-lift truck in such a way that rupture of a single element of the pallets can result in its complete failure as a load carrying object.

25 The present invention can be seen in a variety of different applications having regard to the construction of pallets, processes for the making of pallets and apparatus for the making of pallets.

30 In accordance with the application of the invention to the design of pallets, the invention provides in accordance with one aspect thereof a pallet comprising a base section having a surface layer and two support elements also having surface layers in contact with and secured with respect to the said surface layer of the base section the said surface layers of the support elements being connected each by a flexible hinge portion to the said surface layer of the base section.

35 In accordance with another aspect of this invention an intermediate element for the construction of a load carrying pallet comprises a base section and two wing sections hingedly connected to the base section along opposite sides thereof, whereby the wing sections can be folded under the base section and secured thereto to form the pallet, so that in use of the pallet, the wing sections hold the base section above a ground surface and define therebetween an entry space for palleting lifting and moving means.

50 Preferably in accordance with the aspects of the invention defined above the base and wing sections or support elements are formed from a single element having a flexible surface layer which defines the surfaces or surface layers of both the base section and the wing sections and the element is slit along respective lines through the thickness of the element towards said layer so as to form the wing sections hingedly connected to the base section by way of the surface layer itself.

65 In a preferred construction the said surface

layer is of cardboard and preferably the single element as defined above is comprised of respective outer layers of cardboard having sandwiched therebetween a honey-comb structure made of paper in which the cells of the honey-comb extend perpendicularly to the outer layers.

70 In accordance with the invention also there may be provided additional slit lines arranged in the centre area of the base section so as to define support elements which can be folded into contact with the base section so as to provide a central support element to the pallet in addition to those support elements provided by the wing sections.

80 There are various aspects of the application of the invention to a method of making a pallet.

85 One such aspect is a process for the manufacture of a pallet comprising taking a prepared element having a base section and two wing sections hingedly connected to the base section along respective edges thereof and pivoting the wing sections about their respective hinge edges into positions in which they are in contact with the surface of the base lying between the said edges and securing the wing sections in such positions of contact.

90 A further such aspect is a process for the manufacture of a pallet comprising cutting slits in a single element of pallet forming material along respective lines to form a base section and wing sections, said slits extending from one surface of said element, pivoting the wing sections about a respective hinge line in the other surface of the said element parallel to said one surface, and securing the said wing sections in contact with said other surface.

105 In accordance with a still further such aspect of the invention there is provided a process of making a pallet comprising forming wing sections and a base section from a single element of pallet forming material and securing said wing sections to said base section so as to form parallel support elements.

110 In accordance with yet a further such aspect of the invention there is provided a process of making a pallet comprising taking a longitudinally extending block of pallet forming material, cutting off an element from the block along a line extending perpendicularly to the longitudinal extent thereof forming wing sections and a base section in said element along parallel lines therein, locating said wing sections against a surface of said base section and securing the sections to said surface of the base section.

125 In addition to the said wing sections, the processes in accordance with the invention can also provide for the provision of a central supporting element or additional supporting elements lying between the supporting elements formed by the wing sections.

130 Preferably in accordance with the present

invention the said sections forming the supporting elements are formed by slitting downwardly towards a surface layer so as to form hinge lines in the surface layer as already discussed but, alternatively, the sections can be formed by cutting through the said surface layer so as to form detached wing sections and, if required, centre support sections, and then locating such sections in contact with a surface layer of the base section either as they were originally oriented or in some other orientation and securing them with respect to the surface layer of the base section.

As already discussed above the present invention can also be conceived of in terms of apparatus for the manufacture of pallets.

In accordance with one such further aspect of the present invention there is provided apparatus for making pallets comprising means for locating wing sections of a pallet forming structure against a surface of a base section of said structure and means for securing the wing sections to said surface.

Preferably said locating means includes means for turning wing sections about hinge lines substantially in said surface of said base section.

Where the pallet is formed from a single element of pallet forming material, the apparatus of the invention may also comprise means for forming slits in said material extending towards said surface to define said hinge lines.

The invention will now be further described having regard to specific embodiments thereof which are illustrated in the accompanying drawings and given by way of example only. In the drawings:

Figure 1 is a series of end views illustrating diagrammatically the construction of and manufacture of a first pallet embodying the invention;

Figure 2 illustrates diagrammatically in end views the construction of a second form of pallet and the manufacture of such a pallet in accordance with the invention;

Figure 3 is diagrammatic and schematic plan view of apparatus embodying the present invention for the manufacture of a pallet as illustrated in Fig. 1;

Figure 4 is a view on line IV-IV of Fig. 3.

Figures 5 and 6 are respectively diagrammatic end and bottom plane views of an intermediate product for the construction of a pallet in accordance with a further embodiment of the invention; and

Figure 7 is an end view of a completed pallet of the further embodiment.

Turning now to Fig. 1c of the drawings there is illustrated a pallet comprising a base section 1 and two wing sections 2 and 3. The pallet is formed from a single block 4 of material which has respective outer surface layers 5 and 6 of cardboard and sandwiched therebetween a filling 7 comprised of a

honey-comb structure made of paper in which the cells of the honey-comb extend perpendicularly to the surface layers 5 and 6. In the manufacture of the pallet shown in Fig. 1c the block shown in Fig. 1a is first slit along parallel lines 8 and 9 to form the wing sections respectively 3 and 2, the slits 8 and 9 extending from and through the surface layer 5 as far as but not through the surface layer 6. The wing sections 2 and 3 are now pivoted about the hinge lines defined by the uncut portions of the surface layer 6 until the respective portions of the surface layer 6 on the wing sections 2 and 3 and on the base section 1 are brought into contact. Adhesive is applied to the contacting surfaces prior to the pivoting action so that the wing sections become secured to the base section.

Turning now to the pallet construction shown in the diagrams of Fig. 2, there is again provided a single block 10 of pallet forming material which comprises surface layers 11 and 12 of cardboard and an intervening honey-comb structure as described in relation to the pallet of Fig. 1. A more complex-slitting arrangement is adopted in the case of the pallet shown in Fig. 2c and the series of slits is shown in Fig. 2b. The wing sections are each defined by oppositely directed slits 14 and 15 and 16 and 17 and additional slits 18, 19, 20 and 21 are formed in the central region of the block 10 and again, as illustrated, the adjacent central slits 19, 20 are directed in one direction and the outer slits 18, 21 in the central region are directed in the opposite direction. Each of the slits 14 to 21 is only passed through its respective surface layer 11 or 12 and as far as the other surface layer respectively 12 or 11.

After slitting and the application of adhesive the element 10 can be folded along the pivot lines defined by the slits 14 to 21 to form a pallet as shown in Fig. 2c which comprises a base section formed in two parts 24, 25 and supported by respective wing section support elements 26 and 27 and a central support element 28.

The construction shown in Fig. 2 has the advantage in respect to the construction shown in Fig. 1 in that there is provided a central support element 28 which serves to reduce the bending moments in the base section which bending moments are dependent upon the unsupported span of the base section as well as other factors. In both constructions there is provided a space for the insertion of the tines of a fork-lift truck in such a manner that the tines are not impeded by the various elements of the pallet construction. It is to be noted in this context that contact of the tines with the material of the pallet even under substantial force conditions will not result in severe structural damage of the pallet itself so as to render it unusable.

This derives largely from the use of a complex

honey-comb structure which results in a strong finished article even though the basic materials are relatively weak.

The pallets illustrated in Figs. 1 and 2 have the advantage that they are essentially of a light weight nature and that they are formed from a basic element, blocks and 4 and 10, which can be manufactured in a substantially continuous process. The pallets themselves can also be manufactured by machinery which does not require the intervention of an operator. In addition, the basic materials of the pallet are relatively cheap. Thus, it is possible to construct a pallet which has limited value which makes it possible to consider the pallet as a disposable item which is used once only. This avoids the cost of returning the pallet to the manufacturer after its initial use, although of course, the pallet may be conserved and returned to the paper manufacturer for recycling.

In addition it is to be noted that the pallet can be transported from the pallet manufacturer to the final user in the form illustrated in Fig. 1b or 2b as the case may be. That is the pallet may be transported in its flat form and this, in combination with its light-weight, means that there can be substantial savings having regard to other forms of pallet. The adhesive may be applied by the final user in some relatively simple machinery or the adhesive may be applied prior to transportation and protected by removable strips or applied in such other form as is known in the art which enables the final user to assemble the pallet into the final condition without substantial expenditure on machinery or labour.

Finally, it should be noted that the thicknesses of the elements 4 and 10 will be selected in accordance with the loads to be carried and the need to provide adequate space for the entry of the tines or other elements of the pallet lifting and moving equipment.

In Figs. 3 and 4 there is illustrated a complete line for the production of pallets as shown in Fig. 1. The illustrations are diagrammatic only and it is to be understood that the invention can be expressed in forms of apparatus in relation to separate single items of the various parts shown in Figs. 3 and 4 as discussed above.

The apparatus shown in Figs. 3 and 4 comprises a number of stations in which stages in the manufacture of a pallet are carried out. The various stations are interconnected by roller conveyors which may be driven at varying speeds, if necessary, in accordance with procedures known by those skilled in the art.

At a first station 31 a continuous block of material 32 (whose honey-comb structure is illustrated at 33) is subject to a parting action by a rotating knife 34 which is passed transversely of the block 32 having regard to its

general longitudinal axis along a slit line 35.

In a subsequent station 36 a block 37 parted from the main block 32 in the station 31 is subject to a slitting action along parallel slit lines 38 and 39 by respective rotating knives 40 and 41 to provide slits corresponding to the slits 8 and 9 of Fig. 1b which defines in turn wing sections 42 and 43 in addition to a base section 44.

In a subsequent station 45 adhesive is applied to the non-slit surface of a block 37 by way of spray heads 46 and 47 supplied from a supply line 48.

In the next station 50 the wing sections of a block 51 are turned under by suitably shaped ploughs 52 and 53 and the wing sections are stuck to the base section by the provision of suitable pressure rollers 54 and 55 located above the block 51 and 56 and 57 located below the block 51. The wing sections of the pallet are illustrated in Fig. 4 at 58 and 59.

In the embodiment of the invention illustrated in Figs. 5 to 7, in which Figs. 5 and 6 are respectively an end view and a bottom plan view of an intermediate product and Fig. 7 is the end view of the finished load carrying pallet, the product is made from a layer 60 of cardboard or corrugated cardboard material which defines an upper load carrying surface 61. Three stringers 62, 63, 64 are secured to the underneath surface 62 of the base section 60 and extend parallel to each other along the length of the base section 60. The stringers 62 and 64 extend adjacent the edge of the base section. The stringers 62, 63, 64 are formed of a honey-comb structure made of paper in which the cells 65 extend perpendicularly to the load carrying surface and to cover layers 66, 67 which extend over the open ends of the cells. The upper cover layer 66 is secured by adhesive to the undersurface 62 of the base section 60.

In the intermediate product illustrated in Figs. 5 and 6 the pallet construction described in the preceding paragraph is also provided with two longitudinally extending cuts 70, 71 spaced from the edges of the base section 60 which extend transversely to the stringers 62 and 64. The cuts or slits 70, 71 extend through the base section 60 or to within a short distance of the surface layers 67 of the stringers 62 to 64. The portions of surface layer 67 adjacent to the cuts 70, 71 then serve as hinge portions.

To pass from the intermediate product illustrated in Figs. 5 and 6 to the finished load carrying pallet whose end view is given in Fig. 7 it is merely necessary to hinge the wing sections defined by the cuts 70 and 71 about the hinge portions of the surface layers 67 to the position illustrated in Fig. 7. The end portions of the stringers 62 to 64 now constitute support feet 72, 73, 74 and the adjacent portions of the surface layers 67 are secured

to each other by adhesive. In addition, the strip of the base section 61 severed by the respective cut line 70 or 71 now provides a ground contacting layer which protects the

5 support feet 72 to 74 and also provides additional rigidity to the support structure for the base section 60.

10 In the process for the manufacture of the pallet illustrated by way of Figs. 5 to 7, a base section 60 previously cut to size is laid flat and then three stringers 62 to 64 also previously cut to size, are secured, e.g. by adhesive, to the undersurface 62 of the base section 60. The cut lines 70, 71 are then

15 made from the upper surface 61 down through the base element to form the intermediate product illustrated in Figs. 5 and 6 and then the wing sections are hinged into the position shown in Fig. 7 and the contacting surface layers 67 secured together, e.g. again by adhesive.

The number of stringers or support elements 62 to 64 which are provided in an embodiment of the invention along the lines of that described with respect to Figs. 5 to 7 will depend upon the size and strength required of the pallet. For example, it is readily possible to provide an additional central stringer extending parallel to the stringer 63.

30 In addition, it would be possible to use alternative materials to those described, for example it would be possible to use polystyrene blocks as the stringers if these are provided with a paper or other surface layer which can provide the hinge portion.

35 In addition to the advantages already discussed for pallets in accordance with the invention, the embodiment of the invention illustrated in Figs. 5 to 7 has the advantages of providing for fourway entry for the tines of lift equipment, and an increased height for the entry of the tines on two of the sides of the pallet. In addition, there are cost, weight and material savings in the embodiment under

45 discussion.

CLAIMS

1. A load carrying pallet comprising a base section having a surface layer and two support elements also having surface layers in contact with and secured with respect to the said surface layer of the base section, the said surface layers of the support elements being connected each by a flexible hinge portion to the said surface layer of the base section.

2. A pallet according to claim 1 wherein said surface layers are secured together by adhesive.

3. An intermediate product for the construction of a load carrying pallet comprising a base section and two wing sections hingedly connected to the base section along opposite sides thereof, whereby the wing sections can be folded under the base section and secured thereto to form the pallet, so that, in use of

the pallet, the wing sections act as support elements to hold the base section above a ground surface and define therebetween an entry space for pallet lifting and moving means.

4. A pallet or an intermediate product according to any preceding claim wherein the base section and the wing sections or support elements are formed from a single base element having a flexible surface layer which defines the said surface layers of both the base section and the wing sections and the base element is slit along respective lines through the thickness of the element towards said layer so as to form the wing sections which are hingedly connected to the base section by way of the surface layer itself.

5. A pallet or an intermediate product according to any preceding claim wherein said surface layer or said surface layers are formed of cardboard.

6. A pallet or an intermediate product according to any preceding claim wherein the wing section or support elements are comprised of respective outer layers of cardboard having sandwiched therebetween a honey-comb structure made of paper in which the cells of the honey-comb extend perpendicularly to the outer layers.

7. A pallet or an intermediate product according to any preceding claim wherein the base section and the wing section or supporting elements are formed from a single base element in the form of a pair of outer layers of cardboard having sandwiched therebetween a honey-comb structure made of paper in which the cells of the honey-comb extend perpendicularly to the outer layers.

8. A pallet or an intermediate product according to any one of claims 4 to 6 wherein said surface layers defined by said single base element are discontinuous.

9. A pallet or an intermediate product according to claim 8 wherein said single base element is formed by a base layer and a plurality of stringers secured to one surface of the base layer and extending parallel to each other and perpendicular to said slit lines, the surfaces of said stringers remote from said one surface of the base layer defining said surface layers secured or to be secured together and said hinge portions.

10. A pallet or an intermediate product according to claim 9 wherein said base layer is a layer of cardboard and said stringers are each comprised of respective outer layers of cardboard having sandwiched therebetween a honey-comb structure made of paper in which the cells of the honey-comb extend perpendicularly to the outer layers.

11. A pallet or an intermediate product according to claim 4 or claim 8 provided with additional slit lines arranged in the central area of the base section so as to define support elements which can be folded into

contact with the base section so as to provide a central support element to the pallet in addition to those support elements provided by the wing sections.

- 5 12. A load carrying pallet or an intermediate product for the construction of a load carrying pallet substantially as hereinbefore described with reference to Fig. 1, Fig. 2 or Figs. 5 to 6 of the accompanying drawings.
- 10 13. A process for the manufacture of a pallet comprising taking a prepared base element having a base section and two wing sections hingedly connected to the base section along respective edges thereof and pivoting the wing sections about their respective hinge edges into positions in which they are in contact with the surface of the base lying between the said edges and securing the wing sections in such positions of contact.
- 15 14. A process for the manufacture of a pallet comprising cutting slits in a single element of pallet forming material along respective lines to form a base section and wing sections, said slits extending from one surface of said element, pivoting the wing sections about a respective hinge line in the other surface of the said element parallel to said one surface, and securing the said wing sections in contact with said other surface.
- 20 15. A process of making a pallet comprising forming wing sections and a base section from a single element of pallet forming material and securing said wing sections to said base section so as to form parallel support elements.
- 25 16. A process of making a pallet comprising taking a longitudinally extending block of pallet forming material, cutting off an element from the block along a line extending perpendicularly to the longitudinal extent thereof, forming wing sections and a base section in said element along parallel lines therein, locating said wing sections against a surface of said base section and securing the sections to said surface of the base section.
- 30 17. A process according to any one of claims 13 to 16 including the provision of a central supporting element or additional supporting elements lying between the supporting elements formed by the wing sections.
- 35 18. A process for making a load carrying pallet substantially as hereinbefore described with reference to the accompanying drawings.
- 40 19. Apparatus for making load carrying pallets comprising means for locating wing sections of a pallet forming structure against a surface of a base section of said structure and means for securing the wing sections to said surface.
- 45 20. Apparatus according to claim 19 wherein said locating means includes means for turning wing sections about hinge lines substantially in said surface of said base section.
- 50 21. Apparatus according to claim 19 or

claim 20 where the pallet is formed from a single element of pallet forming material, the apparatus also comprising means for forming slits in said material extending towards said surface to define said hinge lines.

- 70 22. Apparatus for making load carrying pallets substantially as hereinbefore described with reference to the accompanying drawings.

23. A load carrying pallet comprising a base section having a load carrying surface and at least two support elements, said support elements comprising a honey-comb structure made of paper in which the cells of the honey-comb structure extend perpendicularly to said load carrying surface.

24. A load carrying pallet according to claim 23 wherein said base section is comprised of a layer of corrugated cardboard.

25. A load carrying pallet according to claim 23 or claim 24 wherein said support elements extend the length of said base section and at each end of each thereof there is provided a support foot composed of the same material as the support elements.

26. A load carrying pallet according to any one of claims 23 to 25 wherein a strip of cardboard extends across each end of the pallet and is secured to the surfaces of the support feet remote from the said load carrying surface.

27. A load carrying pallet according to claim 25 wherein the said support feet are connected to the support elements by a surface layer common thereto.

28. A load carrying pallet according to claim 27 wherein a strip of the material comprising said base section extends across said support feet remote from said base section.

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